

# Notice of Allowability

Application No.

10/669,259

Examiner

Yubin Hung

Applicant(s)

TAKAHASHI ET AL.

Art Unit

2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to amendment filed 06/29/07.
2. ☒ The allowed claim(s) is/are 1-5, 7, 10-12, 14-17 and 19-25 (renumbered as claims 1-20).
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All b) ☐ Some\* c) ☐ None of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

## Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),  
Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

***Response to Amendment/Arguments***

1. This action is in response to the amendment filed on 06/29/07, which has been entered.
2. In view of Applicant's amendment, the 35 USC § 112 rejections have been withdrawn.
3. Claims 1-5, 7, 10-12, 14-17 and 19-25 as amended below are allowed.

### **EXAMINER'S AMENDMENT**

4. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with William C. Rowland on August 20, 2007.

**5. The application has been amended as follows:**

**5.1 Replace all claims with the replacement claims listed in Appendix A.**

***Allowable Subject Matter***

6. Claims 1-5, 7, 10-12, 14-17 and 19-25 as amended above are allowed.

7. The following is an examiner's statement of reasons for allowance:

A. Regarding claim 1, and similarly claims 4, 7, 10 and 16, closest art of record do not disclose all limitations. Specifically, Atsumi et al. (US 6,801,665), Christopoulos et al. (US 6,804,405, in Fig. 5 and Col. 5, lines 3-10), Sato et al. (US 6,985,632, in Figs. 19, 20A-20C and Col. 15: 52-Col. 16, line 44), Maeda et al. (US 6,968,088, in Figs. 1, 2A-2C, 7 and Col. 15, lines 39-57, Grosbois et al. ("New Approach to JPEG 2000 Compliant Region of Interest Coding," SPIE, Vol. 4472, 2001, pp. 267-275) and Wang et al. ("Bitplane-by-Bitplane Shift (BbBShift)—A suggestion for JPEG2000 Region of Interest Image Coding," IEEE Signal Processing Letters, Vol. 9, No. 5, May 2002, pp. 160-162) disclose various ways of shifting coefficients in the ROI. However, none of the above-cited references, alone or in combination, disclose, teach or suggest shifting all coefficients (i.e. both the ROI and the non-ROI coefficients) in ROI boundary tiles (in the case of claim 4, ROI boundary tiles for color difference component only). Furthermore, for claim 4, none of the references cited above, alone or in combination, disclose, teach or suggest processing the tiles (i.e., shifting the coefficients) from the luminance and the color difference components differently, either.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Contact Information***

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yubin Hung whose telephone number is (571) 272-7451. The examiner can normally be reached on 7:30 - 4:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew C. Bella can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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9. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Yubin Hung  
Patent Examiner  
Art Unit 2624

August 20, 2007



MATTHEW C. BELLA  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2600

***Appendix A: Replacement Claims***

1. An image processing apparatus for decoding image data comprising frequency transform coefficients, the image data being divided into a plurality of tiles, each of which is in an encoding or decoding process, the image processing apparatus comprising:

a detector which detects an existence status of a ROI set within said image data;

a determiner which determines whether each tile is a ROI tile that is composed only of ROI coefficients, a non-ROI tile that is composed only of non-ROI coefficients, or a ROI boundary tile composed of both ROI coefficients and non-ROI coefficients based on said existence status of the ROI set detected by said detector; and

a processor which shifts frequency transform coefficients of said ROI set within each tile determined to be a ROI tile to a lower bit side, and which shifts frequency transform coefficients of both the ROI set and a non-ROI set within each tile determined to be a ROI boundary tile to the lower bit side.

2. The image processing apparatus according to claim 1, wherein said detector detects the existence status of the ROI set based on the frequency transform coefficients of said tile for every tile.

3. The image processing apparatus according to claim 1, wherein said processor shifts the frequency transform coefficients to the lower bit side for a tile determined to be a non-ROI tile which abuts with said ROI boundary tile.

4. An image processing apparatus for decoding image data comprising frequency transform coefficients, the image data being divided to a plurality of tiles, each of which is in an encoding or decoding process, the image processing apparatus comprising:

a detector which detects an existence status of a ROI set within said image data;

a determiner which determines whether each tile is a ROI tile that is composed only of ROI coefficients, a non-ROI tile that is composed only of non-ROI coefficients, or a ROI boundary tile composed of both ROI coefficients and non-ROI coefficients based on said existence status of the ROI set detected by said detector; and

a processor which performs a specific process for frequency transform coefficients of the ROI set and a non-ROI set within each tile for luminance component and color difference components,

wherein said processor

shifts the frequency transform coefficients to a lower bit side for luminance components and for color difference components for each tile determined to be a ROI tile,

shifts the frequency transform coefficients to the lower bit side for color difference components for each tile determined to be a non-ROI tile,



shifts the frequency transform coefficients to a lower bit side for the luminance components and for the color difference components corresponding to the ROI set for each tile determined to be a ROI boundary tile, and

shifts the frequency transform coefficients to the lower bit side for the color difference components corresponding to the non-ROI set for each tile determined to be a ROI boundary tile.

5. The image processing apparatus according to claim 4, wherein said detector detects the existence status of the ROI set based on the frequency transform coefficients of said tile for every tile.

6. (Canceled)

7. An image processing apparatus for decoding image data comprising frequency transform coefficients, the image data being divided to a plurality of tiles, each of which in an encoding or decoding process, the image processing apparatus comprising:

a detector which detects an existence status of a ROI set within said image data based on frequency transform coefficients of every tile;

a determiner which determines whether each tile is a ROI tile that is composed only of ROI coefficients, a non-ROI tile that is composed only of non-ROI coefficients, or

a ROI boundary tile composed of both ROI coefficients and non-ROI coefficients based on said existence status of the ROI set detected by said detector;

a processor which performs a first process for each tile determined to be a ROI tile or a non-ROI tile, and which performs a second process for each tile determined to be a ROI boundary tile by said determiner;

said first process shifts the frequency transform coefficients to a lower bit side for each tile determined to be a ROI tile, and

said second process shifts the frequency transform coefficients to the lower bit side for each tile determined to be a ROI boundary tile.

8. (Canceled)

9. (Canceled)

10. A method of processing image for decoding image data comprising frequency transform coefficients, the image data being divided to a plurality of tiles, each of which is in an encoding or decoding process, the method comprising steps of:

detecting an existence status of a ROI set within said image data based on frequency transform coefficients of every tile;

determining whether each tile is a ROI tile that is composed only of ROI coefficients, a non-ROI tile that is composed only of non-ROI coefficients, or a ROI

boundary tile composed of both ROI coefficients and non-ROI coefficients based on said existence status of the ROI set detected in said detecting step; and

performing a first process for said ROI tile and said non-ROI tile determined in said determining step, and performing a second process for said ROI boundary tile determined in said determining step;

said first process is shifting the frequency transform coefficients to a lower bit side for each tile determined to be a ROI tile, and

said second process is shifting the frequency transform coefficients to the lower bit side for each tile determined to be a ROI boundary tile.

11. The image processing apparatus according to claim 1, wherein the processor shifts the frequency transform coefficients for the ROI boundary tiles such that a bordering line around the ROI of the image data can be added.

12. The image processing apparatus according to claim 1,  
wherein the determiner determines whether each tile is a non-ROI tile bordering a ROI boundary tile, and

wherein the processor shifts the frequency transform coefficients of a non-ROI tile bordering a ROI boundary tile to the lower bit side.

13. (Canceled)

14. The image processing apparatus according to claim 4, wherein the processor shifts the frequency transform coefficients for the color difference components of the ROI boundary tiles and the non-ROI tiles such that the non-ROI of the image data after decoding is displayed in monochrome.

15. The image processing apparatus according to claim 14, wherein the processor shifts the frequency transform coefficients for the color difference components of the ROI boundary tiles and the ROI tiles such that the ROI of the image data after decoding is displayed in color.

16. An image decoding apparatus for decoding a tile of image data comprising frequency transform coefficients, wherein the tile is one of a plurality of tiles of the image data, each tile being in an encoding or decoding process, the image decoding apparatus comprising:

a dynamic range analyzer configured to analyze a dynamic range of the tile, wherein the dynamic range is based on a number of bits representing transform coefficients of the tile;

a determiner configured to determine whether the tile is a ROI tile that is composed of only ROI coefficients, a non-ROI tile that is composed of only non-ROI coefficients, or a ROI boundary tile that is composed of both ROI coefficients and non-ROI coefficients based on the dynamic range of the tile analyzed by the dynamic range analyzer;

a processor configured to reduce the transform coefficients of the tile based on whether the tile is determined to be a ROI tile, a non-ROI tile or a ROI boundary tile, and

wherein the processor is configured to reduce all transform coefficients of the tile by a predetermined reduction amount when the tile is determined to be a ROI boundary tile.

17. The image decoding apparatus according to claim 16, wherein the determiner is configured to

determine that the tile is a non-ROI tile when the dynamic range of the tile is less than a predetermined dynamic range threshold,

determine that the tile is a ROI tile when the dynamic range of the tile is equal to or greater than the predetermined dynamic range threshold and there are no transform coefficients of the tile that is less than the predetermined dynamic range threshold, and

determine that the tile is a ROI boundary tile when the dynamic range of the tile is equal to or greater than the predetermined dynamic range threshold and there is at least one transform coefficient of the tile that is less than the predetermined dynamic range threshold.

18. (Canceled)

19. The image decoding apparatus according to claim 17, wherein the predetermined reduction amount is equal to the predetermined dynamic range threshold.

20. The image decoding apparatus according to claim 17,  
wherein the determiner is further configured to determine whether the tile is a border non-ROI tile that is composed of only non-ROI coefficients and borders at least one ROI boundary tile, and

wherein the processor is configured to reduce all of the transform coefficients of the tile by a predetermined reduction amount when the tile is determined to be a border non-ROI tile.

21. The image decoding apparatus according to claim 17,  
wherein the transform coefficients of the tile include luminance and color difference transform coefficients, and

wherein when the tile is determined to be a ROI boundary tile, the processor is configured to

reduce the luminance transform coefficients of the ROI set of the tile by a predetermined reduction amount,

reduce the color difference transform coefficients of the ROI set of the tile by the predetermined reduction amount,

leave unchanged the luminance transform coefficients of the non-ROI set of the tile, and

reduce the color difference transform coefficients of the non-ROI set of the tile by the predetermined reduction amount.

22. The image decoding apparatus according to claim 21, wherein the predetermined reduction amount is equal to the predetermined dynamic range threshold.

23. The image decoding apparatus according to claim 21, wherein when the tile is determined to be a ROI tile, the processor is configured to reduce the luminance and the color difference transform coefficients of the tile by the predetermined reduction amount.

24. The image decoding apparatus according to claim 21, wherein when the tile is determined to be a non-ROI tile, the processor is configured to leave unchanged the luminance transform coefficients of the tile, and to reduce the color difference transform coefficients of the tile by the predetermined reduction amount.

25. The image decoding apparatus according to claim 17, wherein the transform coefficients of the tile include luminance and color difference transform coefficients, and

wherein the processor is configured to reduce one or both of the luminance and color difference transform coefficients of the tile such that the ROI of the corresponding image data after decoding is displayed in full color and the non-ROI of the corresponding image data after decoding is displayed in monochrome.